CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

ENERGY EFFICIENCY COMMITTEE

WORKSHOP

EVAPORATIVELY COOLED CONDENSING UNITS COMPLIANCE OPTION

CALIFORNIA ENERGY COMMISSION

HEARING ROOM B

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

THURSDAY, OCTOBER 27, 2005

10:06 A.M.

Reported by:
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STAFF PRESENT

Ram Verma, Senior Mechanical Engineer

Bill Pennington, Chief Energy Efficiency
Program Specialist

Bruce T. Maeda

Smita Gupta

Nelson Pena

Randel Rieder

David Rubens

Adel Suleiman

Tony Wong

Virginia Lew

Haile Bucaneg

ALSO PRESENT

Rocky Bacchus, Vice President
Freus

Ken Nittler, P.E.
Enercomp, Inc.

Karl Kurka, CUWCC

Thomas E. Pape, Technical Advisor
California Urban Water Conservation Council

Patrick Eilert, PG & E

Barry Brooks
Indirect Evaporative Technology Co.

Michael Day
Ice Energy

David Weightman, DGS

I N D E X

P R O C E E D I N G S

MR. PENNINGTON: Good morning, I am Bill Pennington, the manager of the Buildings and Appliances Office at the Energy Commission. We welcome you to this workshop to get public input on proposed compliance option for the Title 24 Building Standards Performance Standards Approach for Evaporative Cool Condensing Units.

I don't have a lot to say here other than we take these compliance options proposals very seriously, and we try to do as thorough a review as we can at the staff level looking for kind of what could go wrong with compliance options. Once they are approved, any errors that we make at the outset can have a long life, and so we try to be careful.

We generally take a conservative approach to awarding compliance credit for any feature, and I must apologize for the delay this has taken to get to this point. I am sure that you expected we would get here much sooner. Commission Staff has very limited staff resources that we can put on this. We do try to do a thorough review and that ends up with almost

always more time taken to get to this point than the applicant would like. So, I apologize for that.

We actually think this is an extremely interesting technology and worthwhile technology, and we are very interested in getting public comment on the evaluation that we've made today, so our plan is to go through that, and we would invite any comment from anyone at this point.

Thank you.

MR. VERMA: The second item on the agenda is introduction, so I would like to introduce ourselves one by one. I am Ram Verma with the California Energy Commission.

MR. PENNINGTON: I am Bill Pennington. Go ahead.

MR. BACCHUS, Freus Air Conditioning.

MR. NITTLER: Ken Nittler with Enercomp.

MR. PENNINGTON: Why don't we introduce the people in the audience as well. Is there a handy way to do that to get the recording.

MR. MAEDA: Bruce Maeda with the California Energy Commission.

MR. PAPE: Thomas Pape with the California Urban Water Conservation Council.

MR. KURKA: Karl Kurka with the California Urban Water Conservation Council.

MR. BROOKS: Barry Brooks, (inaudible) Indirect Evaporative Technology Company (inaudible).

MR. DAY: Michael Day, Ice Energy.

MS. GUPTA: California Energy Commission.

MR. PENA: Nelson Pena California Energy Commission.

MR. BUCANEG: Haile Bucaneg with the California Energy Commission.

MS. LEW: Virginia Lew, the Energy Commission.

MR. WONG: Tony Wong, California Energy Commission.

MR. RUBENS: Dave Rubens, California Energy Commission.

MR. SULEIMAN: I am Adel Suleiman, the California Energy Commission.

MR. VERMA: Thank you very much, and now I will present to you the highlights of our staff report on Evaporatively cooled condensing units.

We prepared a report (indiscernible) this compliance option, and Bill Pennington,

Bruce, (Indiscernible), (Indiscernible), and Beverly; they all worked very hard on this report. So, I am going to present the highlights of the report.

The Commission accepts and approves compliance options under Section 10-109(b) of (indiscernible) 6 of Title 24.

What is a compliance option? Buildings that are colored by standards, they have to comply with all mandatory requirements. In addition to that, they have either to comply with efficiency measures, which is where we list all the efficiency measures one by one. They have to comply with all of them, or they can comply with the performance approach.

In performance approach, we have a standard budget that is based on the prescribed requirement, and the proposed budget is based on your actual design. You can trade off measures in performance approach.

For example, you can do (indiscernible) and you can do worse in the lighting, but your all out budget should not exceed the standard budget.

Commission has approved some building software that can be used to show compliance with

this approach. Calculations and algorithms are available for most of the energy efficiency measures and (indiscernible).

Basically, a compliance option is like calculations and algorithms so that the impact of these measures are accurately reflected in performance approach, and it is used in the performance matter only. Generally it is for new technologies, new products, or new measures.

We have (indiscernible) cool condensing units, they are similar to the old conventional air cooled unit, but the exception is the condenser tubes are continuously sprayed with water. There is a pump that sprays water through the nozzles on the connecting tubes. The tubes remain wet when compressor is operating. These are more efficient compared to the conventional unit because that temperature at the condenser is lower.

We require product to (indiscernible) on the connecting tubes to prevent erosion or deposit of salt on the tubes, and we require automatic flush of the water jacket of the water basin to renew all the solids. There are other productions. I will cover these things in our

eligibility (indiscernible).

When we are wording this proposal, we used the Micro Pass which is California and Energy Commission approved software for the buildings. What we did, we used a standard 1761 skit (indiscernible) house. We would have the standard measure D and standard air conditioning unit (indiscernible) here, and this is where we calculated our standard budget.

For the proposed design, we kept everything the same, but we changed the commercial air cool unit, we replaced it with an evaporatively cooled condensing unit, and then we calculated energy assess again.

This is the result of energy uses. I have two pages. This is for Climate Zones 1 through 8, and next is from 9 through 16. Plus a second column is cooling energy use using the standard measures. The second one is proposed with the evaporatively cooled condensers. Then we have total energy for both cases.

As you can see in the last two columns, the percentage production in cooling and total energies. So, we see 21 percent, 23 percent, 27 percent reduction in cooling energy and .229

percent reduction in total energy.

This energy is based on TDV. That means the savings are multiplied by TDV multiplier instead of remember we used to have source energy uses before. In the new standard, instead of using source energy, we calculate TDV, Time Dependent Evaluation of Energy.

We calculate hourly energy consumption and multiply it by a TDV factor, which depends on time of use is high for that peak period, and it is low for off peak periods.

This is the same thing for Climate Zones 9 through 16. If you see reduction in total energy use and it is high for Climate Zone 9 through 15, for 15 it is 49 percent reduction in energy, 15 is a very hard climate zone, Imperial Valley and cooling load is very high. This kind of technology is very very effective.

In order to qualify this equipment for compliance (indiscernible), we want them to meet these criteria, so we call it (indiscernible) criteria. We require that this summary does energy efficiency initials EER at two points. One at 95 degree dry bulb and 75 degree wet bulb temperature. Second at 82 degree dry bulb and 65

degree wet bulb temperature.

If this EER is calculated using TXV, then we require verification that TXV is actually installed in the field. We require duct testing with these measures. If you want to install this thing, you have to test and seal your ducts. If you want credit for proper verification charge, it shall be checked.

To make sure the (indiscernible) is working as desired, we have acceptance requirement. To qualify for credit, these are the acceptance requirements that will be checked in the field, all certified by the contractor according to the manufacturer's data.

The first thing is we will verify that there is water in the casing, in the water casing. He will switch on the cooling system by setting the room temperature lower than actual. The system will kick on, and then they have to make sure that the water pump starts running less and less the system is switched on.

When the water pump is running, we want to make sure that all the condenser coils are wet. This is the pressure setting for the compressor. We want to make sure that if water pump drips,

then temperature and the pressure will rise. If that happens, the compressors will drip. To make sure that it is always (indiscernible) cooled.

We require that the compressors will drip if that pressure rises to 300 PSI for every unit (indiscernible). For all other represent the strict one should be set at a pressure 131 degree fahrenheit temperature. Saturation pressure goes (indiscernible).

Then we want to turn off the water supply to that casing and make sure the water pump trips and the compressor trips. We want to verify that condenser coils they have frozen resistant coating to prevent from the deposit of solid on the coating on the tubes.

We want to make sure that the electrolytic protection is installed on the (indiscernible) so that it won't corrode.

Then we want to make sure -- there is flush pump in the casing and it operates based on the one hour of compressor or conductivity of the water in the casing. So, we want a periodic flush of the system. We want that water casing is sloped downward toward the (indiscernible) pump so that all the solids (indiscernible) to the pump,

and when the flush pump is on, that is removed from the casing.

When we approve compliance options, we will develop algorithms and calculations that can be used by software (indiscernible) to calculate the effect of this option in the software.

Basically we have this equation, this is a new equation that will be used to calculate energy impact in the (indiscernible) in the compliance software. In this equation, we've got two EER's, EERa and EERb from the manufacturer. Based on this two EER's, we calculate (indiscernible) EER's which is EERnfa and EER nfb. These are calculated using these equations. Then they are put in this equation to calculate energy efficiency results at different temperatures.

Basically, this equation, this calculates your energy efficiency ratio at different temperatures. In this equation, there are two constants, this constant and this constant, they depend on your (indiscernible) EER's and it is a functional temperature.

In other words, the performance of the system is a function of dry bulb, and we take dry bulb from CEC weather files. This is hourly

editing, and with this we calculate the energy uses.

UNIDENTIFIED SPEAKER: (Inaudible) wet bulb, I believe you said dry bulb.

MR. VERMA: It is wet bulb, yes, sorry. Yeah, the performance is depended on the web bulb.

Whenever we approve something, we require to file prepare an Environmental Impact Report, and what we did, we took the worse case, we took a housing start in California, total number of housing start, and we presumed that every house will have this unit. Based on that, because this credit can be traded off, so what we did we traded off all the credit by increasing the glass area of the house.

We increased the glass area until the house becomes minimally compliant with the standards. If we increase the area, I will increase heating load on the house. If you increase heating load, you will burn more gas. So, considering the worst case energy increase, we calculated increased gas usage and then multiplied that by emission factors, and we calculated these emissions, worst case emissions. These are total emissions state wide, and this is the percentage

increase in emissions. This is assuming the worst case, but actually the impact will be very little, around 5 percent of this because all the houses won't have this unit and all the credits will not be traded fully.

There is no impact on the indoor air quality because the supplied air will never come in contact with the water. There is very little impact on water uses. These units are going to use 4.4 gallons of water in evaporation per hour and 8 gallon per flush. One unit will consume about 7,500 gallon of water in a year.

When we (indiscernible) option, we also made a site visit to a house where this unit was installed, and this unit was in operation for six months, and I looked the (indiscernible) rating operation, it was working fine, and I don't see any deposits on the tubes. It was a three-ton unit, and I checked all the trips that the technician showed me how it would trip, and we actually simulated trips, and we also measured (indiscernible) voltage and temperature of supply and (indiscernible). I feel very comfortable after looking at this unit, and these are our conclusions.

We will get significant energy savings using these units. Eligibility criteria and acceptance requirement will increase the liability of savings. The performance will (indiscernible) because of the deposit on the tubes. The same thing happens for the air cool units, but in this case, the (indiscernible) of performance will depend on the operation and maintenance practices, how you clean your water, how you take care of the equipment, and what is the quality of the water.

At this point, we support the approval of this compliance option. We are asking your comments, especially regarding among the compliance project, reliability of this equipment. If you want to add any other condition to eligibility and acceptance requirement, and if you have any comment on the calculations in ACM, anything on environment, performance degradation, water qualities. Especially we want your comment on water quality in the regions where the water quality is bad. This equipment has potential of significant performance degradation.

We will get public comment from you and we will incorporate both comments in the report, and then we will present our recommendations to

the Energy Efficiency Committee. If they approve it, we will present our recommendation to the full Commission for approval of these compliance options.

So, questions and comments please.

MR. PENNINGTON: Do you want to start? Any comments from you?

MR.BACCHUS: I would just make the brief comments that the evaporative condensing has been used across the United States for approximately 50 years in commercial applications.

This is an application that we've brought forth that is for residential and light commercial applications and involves advances in the technology to make it very applicable on a wide basis with a wide usage of water.

Using the methodologies and some of the requirements have enabled to be much lower maintenance so that it can be applied widely in residential applications, and we believe it is a very positive thing for energy efficiency in the State of California and across the United States.

MR. PENNINGTON: Could you highlight the features of your system that reduces maintenance and increases the reliability of the unit?

MR. BACCHUS: Yes, in our particular application, we have a fiberglass casing. Fiberglass in widely known to not corrode in sea applications, ocean applications, or in very brackish water applications. Then we use solid copper coils for the condenser without fins and a coating on that copper to make it shed scale better.

Scale is going to come out of the water, but if it is shed inherently by the coil, because as the coil moves with thermal changes, the scale gets brittle and then it cracks off, and, therefore, it becomes to a large extent self cleaning.

Then having a flush system to flush out the minerals in a regular maintenance program, which we promote from the factor, helps to maintain the efficiency.

One of the advantages is by having the high pressure cut off switch, if the unit is not operating efficiently, it will start shutting itself off. You won't have it run in an inefficient manner because it will turn itself off. The homeowner will either decide they don't want air conditioning or they will have it

serviced.

In which case, we have been able to show that even after severe amounts of scale are built up by intentionally removing the flush system to evaluate that, that they quickly clean themselves back up without having to have a major repair. So, it is relatively easy to maintain.

MR. PENNINGTON: Any other comments on what the staff has recommended for calculations or for eligibility criteria or acceptance requirements?

MR. BACCHUS: We reviewed all of the staff recommendations including eligibility requirements and the calculations and believe those to be appropriate.

MR. VERMA: One point I would like to make that regarding liability of savings, if you install the system and if it doesn't work, you can't replace it with a conventional unit. You have to have a permit, and you have to either you can do performance method and do other efficiency measures. So, there is a liability of savings here, that you can't replace it with a conventional by standards.

Any other questions or comments?

MR. MAEDA: I have a question, Rocky. I am Bruce Maeda, California Energy Commission staff. You mentioned it is fiberglass casing, is there any UV degradation problems associated with your fiberglass casing?

MR. BACCHUS: The fiberglass casings that we manufactured we had evaluated with accelerated weatherometer tests by underwriter's laboratory. There is a loss of color fastness, and so over time, it will yellow to some extent, and it will get a slight powdering effect on the surface. The UL evaluation said that there is about five percent degradation of the surface over 30 years, so we consider that to be pretty nominal.

If perfect color was an issue, then that would be significant, but as far as loss of strength, it was less than five percent over 30 years.

MR. MAEDA: Does that in turn affect your corrosion resistance?

MR. BACCHUS: No, I don't believe it affects corrosion resistance at all.

MR. PENNINGTON: Do you want to make a comment? Come forward, please. Would you

identify yourself again?

MR. KURKA: I am Karl Kurka, I am the Assistant Director of the California Urban Water Conservation Council. The Council represents approximately 180 water agencies in the state supplying 75 percent of the state's urban water supply, and we also represent most of the major environmental organizations in this state.

Thank you for the opportunity to comment. We have worked with the CEC on setting standards for high efficiency washers and spray valves used in restaurants for both energy and water usage.

We, of course, are concerned about water conservation and water usage in this state. Like energy, California is going to have difficulty meeting future water demands, therefore, we must use water as efficiently as possible.

We are concerned that the draft report does not provide adequate information for us to assess the water consumption of this product. Only an estimated aggregate is provided.

We tried to do some of our own estimates ourselves, which come out a bit higher than the CEC estimates. We are not certain of our

estimates, but we estimate that the units could use ten to fifteen gallons per hour based on the manufacturers claims that this would increase water bills $9.00 to $39.00 per year.

This suggests a 20,000 to 30,000 gallons per summer likely consumed per home. If our estimates are correct, this might increase water use 100 to 300 gallons per day per home. For some homes, this product would more than double the water demand and consumption negating the Council's efforts to conserve water in homes. This would include retrofitting toilets, showers, and high efficiency washers.

We are also concerned that this water use would occur during summer peaks when water retailers are already under stress to meet water demand and provide adequate water pressure for water hydrants.

The draft report assumes that this product will not be used in the retrofit or home remodels. We believe this product will be popular for retrofits, especially for home remodeling to meet new stricter energy efficiency standards.

Use in these situations should also be included in the water use assessment. The staff

draft report uses a statewide average of climate to assess water use. We know that much of the state's future growth will occur in the hot, dry central valley, so, probably a different assessment of climate should be used to assess water.

We are also uncertain whether the water use estimate included flushing of the unit to remove mineral deposits and reduce salt concentration. This could be significant use of water in areas with hard water in the state. We are concerned that water use estimates maybe based on perfectly tuned systems.

We already know that commercial cooling towers using similar water cooled systems often operate inefficiently using two or three times as much water as necessary. Council is currently involved in a commercial cooling tower retrofits to make them more efficient, so we are very much involved in it.

The CEC estimates that treatment and transport of water consumes 18 percent of the electricity in the state. The draft report does not adequately address the embedded energy cost of the water used by these units due to transport and

processing.

Unlike energy, there is only one source for water. Water is not priced according to its true value. Water is only priced according to the treatment and transportation costs. Water is a very precious resource in California. This state is not in a position to exchange energy savings to increase water use with a more thorough investigation and assessment on a potential increased water use of this product.

Our recommendations, the draft report should include an assessment of the actual water use per home based on real life in-field measurements and evaluation.

Finally, we respectively request a more thorough evaluation of water use before this appliance is approved, and we would also like there to be an opportunity for the water agencies in this state to review and comment on the report.

Thank you.

MR. PENNINGTON: Do you have any reaction to those?

MR. BACCHUS: Yes, I'd comment that we would be more than happy to furnish specific water use data to you. If you will leave me a card, I'd

be happy to send that to you. I would also let you know that on a three-ton unit, the net water consumption is probably a net water savings in the State of California.

We have evaluated and looked at the reports from the National Renewable Energy Lab that shows that water is consumed from the production of electricity and for the differential between the electricity saved and the water usage at the site, there is a net water savings to this state, including the fact that not only the electricity is produced in-state, I don't remember the number, 60 or 75 percent of the electricity is produced in-state.

I would also let you know that in evaluating extreme water conservation areas such as Fresno and Bakersfield, that the freus units save approximately 85 percent of the water that is allowed for evaporative condensers under Fresno Section 14-201. That in Bakersfield, they have separate regulations, but that we have designed it to be an extremely water conserving device.

Our objective is to use all possible ways of conserving water, and we are very sensitive to that issue. In fact, we have

designed it so that the water that is normally thrown away from condensate from the indoor house, the water that is condensed out of the air, we actually show the routing back into the unit to reuse that water instead of throwing it away.

Now depending on the water district, most areas call consumptive water versus non-consumptive water and designate between those so that water that goes back into the sewer system is considered non-consumptive because that can be reused.

So, if the water is from flushing is either reused by going into the sewer system or reused by going into vegetation by use to water landscapers and so forth, those are alternate uses of that water that are also considered separately. We do have break out charts that show all of that, and I would be happy let you look at the one I have here today. I just need to use it the rest of the afternoon, and I will be happy to send you a copy also.

We believe that Freus units for the State of California when you consider water usage at the electric plants to generate the electricity are net water savers to the state.

MR. KURKA: May I respond?

MR. PENNINGTON: Absolutely.

MR. KURKA: I believe the report you are talking about as far as water savings goes has to do with the evaporation from reservoirs. Regardless of whether this unit is used in this state, we know that reservoirs are still going to be used at their full capacity, and, therefore, the evaporation savings from a reservoir is I think irrelevant in this assessment.

MR. PENNINGTON: I am not sure I understand that. I think what you are saying is that there is a great deal of water use at power plants, you know, for cooling of power plants?

MR. KURKA: I think it is referring mainly to the fact that unit would save energy, therefore, the hydro-electric facilities would be used at a lower capacity, meaning there would be lower levels of water in the reservoir and less evaporation.

MR. PENNINGTON: I don't think that is the point he is making.

MR. KURKA: Is this the DOE?

MR. BACCHUS: National Renewable Energy Lab. It is NREL, National Renewable Energy

Laboratories report.

MR. PENNINGTON: I want to advocate for his position, but just for clarity, there is, you know, major amounts of water used at natural gas power plants. So, when the Energy Commission is siting a power plant, the water use of that power plant is a major issue is the siting decision. What Rocky is arguing is that by reducing the electricity that is generated, you are reducing the need for power plants and, therefore, avoiding the water that would use for cooling at power plants.

MR. KURKA: Could we see that report to, or is a reference to the --

MR. BACCHUS: I can send you a copy of it. It is NREL's website, and if you give me your card, I will be happy to send you all of that information.

MR. KURKA: Okay, and then I guess the other comment about as far as routing the water back into the system, it is probably not going to be done widely just due to the difficulties and the extra plumbing involved. That is all my comments.

MR. PENNINGTON: Let's talk about that

issue a second. That is something that could be more explicit in the eligibility criteria if need be. You know, the system that is being proposed here, you know, the manufacturer is saying that technology is always within their units. If there is an issue relative to that and to wanting to be sure that any unit that gets installed in houses as a result of this approval of a compliance option, we could establish an eligibility criteria related to that so that the performance that this manufacturer is expecting for their units would happen for other units also.

If that is something that you would like to work with us on, we could do that. Do you have any comments related to that?

MR. BACCHUS: In new construction, it is almost always relatively easy for the builder to arrange to have the water go back to the condenser. In some cases, they have to put a condenser pump in because it may have to go up over something to get to the location depending on how far away it is.

The bigger the building gets, the larger custom homes, the more difficult sometimes that is to do. In retrofits, it is a matter of whether it

is practical or not. It may or may not be practical in retrofit, but in most applications what I would suggest is that I've seen code language that says basically it shall be routed to the condenser unless it is impractical to do so, something of that nature. We would support that.

MR. PENNINGTON: You've seen that language where did you say, in building codes did you say?

MR. BACCHUS: I've seen it more related to evaporative cooling systems where they have talked about routing bleed off systems and things of that nature. There is not a specific language on reusing condensate that I've seen, but I'm thinking of different language for different code measures.

In some areas, they require bleed offs, for example, to go to vegetation. They do not allow it to go to the sewage, and they will say it must go to vegetation unless it is impractical to do so. So, I am thinking of that type of language as being an alternate way to say it, to accomplish what the goal is.

MR. PENNINGTON: What is your view of that? Do you think that would be a mitigator of

your concern?

MR. KURKA: That would probably help. I don't know how much the condensate is an issue in the low humidity here in the Central Valley. I don't know how much water that would provide.

MR. BACCHUS: There are not good studies on all areas. I know that in even low humidity areas, that typically 30 percent of the work done by an air conditioning unit is dehumidification of the house, which maybe actually dehumidifying it to a lower level than is desirable, but that can be up to 50 percent of the water that would otherwise been consumed. It can be substantial or it can be very small if it is already extremely dry.

Of course, weather conditions always vary. Some days are humid even in California, certainly not very many.

MR. PENNINGTON: Could you explain a little bit further about the Fresno ordinance and the Bakersfield ordinance that you were talking about and the requirements as you understand them and how this unit complies with those.

MR. BACCHUS: In our bulletins, which I have in front of me, Freus -- and I can just read

from it because it is fairly short, and that is probably simpler than trying to remember it. Freus in its recirculate water is an example of nominal three-ton unit with a combined water consumption, both the evaporation and the flush, which is what you asked about, would be 4.2 gallons per hour combined.

It will recirculate 900 gallons per hour. That is recirculated, that's not consumed, that is recirculated within the devise. That is a reuse factor of 214 to 1, which is 900 gallons divided by 4.2 that are evaporated or flushed. That is a reuse factor of 214 times.

Freus units generally have much lower water consumption than the allowed amount in the areas that have absolute water consumption standards. Fresno, California, for example, Section 14-201 limits the evaporative condenser consumption to .15 gallons per hour per ton of capacity.

A three-ton unit offers an 84 percent savings versus its limit by using just .025 gallons per minute per ton or 1.5 gallons per hour per ton.

This is 3.16 gallons per hour

evaporative plus 1 gallon per hour net flush, which gives you the 4.2 divided by 60 minutes divided by three tons which comes out to .023 gallons per minute versus the allowed .15. So, .023 versus .15 which is 6.5 times greater allowed amount than what is actually used by a Freus unit.

In Bakersfield, Section 14.12.220, b.23 prohibits low down or bleed greater than one-third or 33 percent of the make up water being discharged to the sewer. Flush discharge to the vegetation is preferred in that area, so the water is used at the site instead of being processed for use down stream.

On a three-ton Freus with total make up water of 4.43 gallons per full load hour and 1 gallon per hour of flush, a Freus has a blown out of just 23 percent of the make up water and is 30 percent better than the code requires.

Electric power generation evaporates 4.42 gallons of water per KW hour of site energy in the western interconnect. The eastern interconnect is about 2.33. This is for the National Renewable Energy Laboratories paper.

Certainly, whoever can argue with the National Labs that wants to, I am just using their

numbers for references.

A nominal three-ton unit in Arizona can save over 9,900 gallon KW hours of power and reuse power producing water consumption by 43,758 gallons. That would be very close to what you would see in Climate 15 out near Yuma or that area of California, I don't remember the names of the cities, the Imperial Valley area. Those are what are recommendations and calculations are. We do not recommend chemical treatments, so that whatever went into the water from the city was in the water, and that is what goes into the flush system.

In Bakersfield, if they want it to go to vegetation, that's fine. In other areas, they want it to go to the sewer. It varies by jurisdiction is what we are seeing.

MR. PENNINGTON: Why would jurisdictions have a different preference, some would want it to go to vegetation, some would want it to go to the sewer. Maybe you might have a response to that question.

MR. KURKA: Say that again as far as it going into sewer versus --

MR. PENNINGTON: Rocky said that some

jurisdictions might prefer to have the flush go to vegetation, others might prefer to have it go into the sewer system.

MR. KURKA: A big problem with recycling water in this state and using it on vegetation is the high salt concentration, so I imagine the flush water is going to have high salt concentrations. If a city is using the water for a purpose such as irrigation where the salt level is too high, it causes toxicity to the plants, so they may not want it in their recycled water.

MR. PENNINGTON: Would this be a policy decision that the local jurisdiction would make? It almost sounds like the owner of the property might have that concern, but --

MR. KURKA: Yeah, I wonder what the -- it is probably not a good idea to use that stuff on certain types of vegetation. Again, it depends on the salt concentration, the types of salt.

MR. BACCHUS: In general, my understanding is that 800 parts per million is the preferred maximum water concentration level, and that if you have bad enough water, they will allow you a permit up to a thousand parts per million and still considered potable water.

The Freus units are going to concentrate whatever the basic water coming in up to about two and a half times, so in a worst case scenario, you might be 2,500 parts per million. If you compare that to sea water, which is like 25,000 parts per million, there is a very wide difference there. There are certain types of plants that prefer more mineral content in it. We've not had any negative feedback from people using that water to water vegetation area. It is certainly just a portion of the water, this is not a huge amount of water, especially if you are only flushing -- if you flush once every eight hours of run time, as an example, in mild weather, that may mean you only flush once every three or four days. At most, it may be flushing twice in one day if you were operating sixteen hours continuously, which would be very rare, that would be very extreme weather conditions. So, when the water is flushed, I think that the main issue of which areas want water put back into the sewer system versus which area want it to go to vegetation, has more to do with the condition of the soil for foundation settling.

Some areas are concerned that if you put

water on the ground, that it may cause the foundation to settle, and that there is a building code requirement, they are concerned that they could cause some type of foundation issues which people would be liable for. In that case, they want it to go in the sewers, so there is no issue of how water was discharged in areas that wanted to go to the vegetation, it is usually based on a concept that that is the best way to save water.

Some people that are the field representative water departments will say, well, obviously if you use it on the ground, it is wasted. Other people will say, obviously, if you put it into the sewer, it is wasted whereas they don't realize that putting it into the sewer, it can be reused by the water department.

It seems to be more just a variation in the individual philosophy of the water departments as to what I hear in the various jurisdictions. The building code requirements are very much a matter of foundation issues where we always here where they tell you that you must put in a sewer, it is usually because they are worried about foundation settling.

MR. VERMA: I have a question for you.

You indicated ten to fifteen gallon per hour. Is it based on three-ton (indiscernible) and what climate zone?

MR. KURKA: I'm going to let our technical staff address that, but in closing as far as my comments are concerned is that we are not opposed to this device. We are basically saying that there is not enough information in the report for us to assess how much water this is using and maybe you've got it here, and that could be put into the report or give it to us. We just don't know, there is not enough information provided.

Also, perhaps some of these issues that we've talked about here need to be considered in the like the peak demand, the fact that growth is going to occur in the Central Valley, the fact that this product is going to be used in retrofits and remodeling. Some of these issues need to be part of the assessment.

Again, we are not opposed to the product, we just need to learn more about it. I will turn it over to our technical --

MR. PENNINGTON: Why don't you just stay there. You wanted to respond, Ken.

MR. NITTLER: Actually, it is probably a response to something you said earlier, Thomas -- I'm sorry, Ken Nittler with Enercomp.

I think when you were describing what you were recommending, you used something, a phrase, something to the equivalent that the CEC not approve this equipment.

I just want to make it clear that what the CEC has before them is an approval of a weighted provide calculations for this product. The product can already be used in California.

With regards to the fact that this equipment may be used in replacement, I think the part that the Commission is approving today or talking about approval, excuse me, is highly unlikely to influence how often this product is used in replacement housing because the vast preponderance of replacements are done without any calculations. My guess is that it has very little influence on that market what the Commission is looking at.

MR. VERMA: It would be very hard to do because of what requirement, standard requirement, it is very hard. They have to run the calibration again.

When I calculated water usage in that report, I assumed that house are occupied 24 hours a day, but normally in practice, people are not home during the peak period or during day times.

MR. KURKA: If the thermostat was set cool at a constant level throughout the day on a 24 hour day?

MR. VERMA: Yes, and also it would be more than what is in that report regarding what (indiscernible), with a (indiscernible), an increase due to water use increase, and also (indiscernible) and environmental impact on NOx CO, but what I find out is these numbers don't change. In fact, was so low. These numbers didn't change with the water usage.

MR. PENNINGTON: That is not showing water there?

MR. VERMA: No, when calculate (indiscernible), that increase to the water usage and their impact on emissions. The emission, they don't change at all.

MR. PENNINGTON: I understand your point. You did look at that water usage, right, and that is not on your slides?

MR. VERMA: Yeah, it is in the report.

MR. PENNINGTON: Page nine of the report. There is a question earlier, what was your question again?

MR. PAPE: How we derive the water usage. Because I really couldn't really pull it out of the report clearly, we used two different methods. One was we called the manufacturer, their technical assistants, and we were told -- we asked how much water was used, and we were told they didn't know how much water used, but they tell homeowners it could be $9.00 to $39.00 a year in water costs.

So, I roughly took the middle of the road $25.00 and took just for easiness a typical $1.00 per 1,000 gallons, and came out with 25,000 gallons. That is a great deal more than 7,000.

Again, I don't know where the $9.00 to $39.00 came from, but even if we take that number, we are looking at -- then divide that by 180 days of cooling, again rough number, because that is not spread out 365 days a year. Now, again, I realize that is not a scientific method, this is in the top of my head, and come up with 180 gallons per day could peak -- now we are concerned about -- our greatest concern is the

summer peaking issue, the July, the August, when water agencies are already having a great deal of time trying to meet the water demand.

Now, even if we take the 7,500 quote and we start dividing that, roughly we are getting 35 to 50 gallons per day during the cooling season, which means the peak days, July or August, this could go 75 maybe 100 gallons. I don't know, but I am just saying if you are spreading this out over the whole cooling season, we are worried about the peak, okay --

MR. VERMA: I can give you numbers on the peak, yeah, I can, yes.

MR. PAPE: -- so that is kind of where we got the numbers. Like we said, we are not certain how large of an issue this is, but I know that we've already gotten many of our member agencies in the summer going to odd/even day watering just to try and meet the peak. You add another 50 to 75 gallons to the water usage per day, again, mostly happening during the same peak hours as the water usages, I hate for them to have to go to an even/odd day to air condition. This would not be acceptable.

We don't know how big a problem this is,

but we just try and stay cautious, let's give us time to really look at this.

A couple of other events, the condensate water. Purely anecdotal, I grew up in the Midwest, St. Louis area, and when we got our first central air conditioner, a three-ton unit, 90 degree weather, 90 percent humidity, because me and my dad installed it ourselves, we sort of forgot about the condensation line, so we had the hose run into a bucket, a five gallon bucket. I know I would have to empty that twice a day, take it upstairs and empty it out. So, that is ten gallons. Now, I could be wrong, it may be more water, but roughly about twice a day, I'd have to empty out a five gallon bucket. So, I am not sure how much this condensation is really going to make up for the water use. It is certainly a great idea, but as they discuss, sometimes it is not going to be practical to move that condensation water over to the unit to use in the evaporation. It would be great if it did.

An additional concern I have is you talked about the net water, it is no different because the power plant, there won't be as much evaporation. That is great except is that water

saved at the power plant reservoir, doesn't get to the water agency who is trying to meet this demand.

In theory it is perfectly well, but that doesn't have water agency, you know, that it is trying to meet the demand and can't, you know, is it going to be trucked to them. It is not going to help them.

MR. PENNINGTON: Let me ask you a question about that. Will you continue on that same thought, or will you --

MR. PAPE: No, no, no, I'm (inaudible).

MR. PENNINGTON: On that thought, are you familiar with how power plants normally get their water?

MR. PAPE: Yes, somewhat. Actually, my college degree is in energy, not in water --

MR. PENNINGTON: Could you explain what the normal practice might be for providing water for power plants?

MR. PAPE: It is usually coming from a river, reservoir, somewhere that is --

MR. PENNINGTON: The water agency is not providing that water. The water agency is not involved --

MR. PAPE: Not usually directly. Not necessarily where the home is using this unit. In some cases that is true, but where the home is using this unit is not necessarily the same water agency that is sharing the water supply with the power plant.

MR. PENNINGTON: That is clearly true, but just in general, you are saying water savings from a power plant is not important to water agencies.

MR. PAPE: It is important, but it doesn't directly solve the problem for the water agency that is having the problem necessarily meeting the peak demand. It is indirectly absolutely in some ways, all water is mostly shared, but not always, and maybe not necessarily that water that is saved at the site of the power plant may not be available to the water agency that is trying to meet the demand to serve this air conditioning unit.

Again, I know that we are not going to see, you know, 100 percent of the homes retrofitted with these units over night. It is going to be a small piece, but we had a little concern for this.

The same thing with the water that goes into the sewer, not all waste water is converted to reclaim water.

MR. KURKA: Very small portion of it.

MR. PAPE: A very small portion of it.

MR. KURKA: We don't technically consider that to be conservation. I believe putting it back into the sewer, agriculture considers that to be a conservation measure, but in urban water conservation, I don't think we do.

MR. PAPE: It is not presently considered. In theory, it would be great because we should reclaim more water and use it. I guess our other concern is are we looking at the water use at 7,500 being best case scenario where the system is tuned up. Even if they are using the water to water their landscape, the flush water, what we tend to see even with some gray water systems is when something doesn't quite go wrong, the customer just shuts it down and starts dumping it into the sewer instead of really fixing it.

The same thing kind of happens, we are now starting to do work in commercial sector on cooling towers. Cooling towers in a lot of cases be a COC level, you know, 5 cycles of

concentration with a good water quality areas. We are seeing them at 2, 1.8, so we have a concern, will these things stay tuned up properly, or will the float valve goes out start flushing more water than necessary. These are sort of the questions we have. We are certainly not against them, we applaud the effort.

From the energy efficiency side of me, I've always thought that air conditioning, especially home air conditioning units, were terribly inefficient, so I applaud the idea. I guess Council would like to take a little closer look at this, and maybe there is mitigating measures, like for instance, if they put in and require a gray water system to reuse the water, maybe some sort of program where we encourage them to offset the water use by having a high efficiency clothes washer, HET toilet, a 1.3 gallon per flush toilet, different things we can do to mitigate this or at least to educate the homeowner the impact this would have on their water bill, so at minimum, the consumer makes an informed decision.

You are also looking at the trend with water agency going to budgeted water rates based

on the number of people per house, and a system like this could easily throw them over their budget and make them go into the punitive charges of overrunning their budget. Consumers should just be aware of this at minimum.

I think the water agencies would like the information so if consumers call in and ask, they have the technical information to give them the proper information on what impact this would have on their water. Right now, this is not on the rater's screen of most water agencies.

MR. PENNINGTON: I wonder, Rocky, do you have information about changes in water use over the life of your products?

MR. BACCHUS: I'm trying to think about what would cause water usage to change. I mean obviously you can have broken water valve in a toilet or you can have a broken water valve in an air conditioner, and neither one of them would cause you to overflow and use excess water.

I guess part of what I would point out is the water connection of this unit is one quarter inch. You are not talking about something that can have the volume of like a broken pipe to a sprinkler system for the yard where you using a

high peak amount of water. This is a quarter inch water line that connects to this unit. It is like an ice maker in an ice machine. Over time, scale build up and those kind of things tend to improve performance, not decrease it because it improves wettability.

In terms of increasing water consumption, what we've seen is that the outdoor conditions have very little impact on water consumption. The amount of tonnage of air conditioning is what overridingly determines how much water is consumed, and the weather conditions are pretty small.

People try to equate this to evaporative cooling, and it is really not an equivalent type of system. Evaporative cooling, the more air you flow, the more water it consumes. In this unit is a relatively small amount of air flow, and the water consumed is dependent upon how much is evaporated to cool the refrigerant. That is the overriding determinate, and you are talking -- I mean in a climate like Northern California where you have 300 hours of full conditions, you are a three-ton system, you are at maybe a thousand gallons a year. It is a very small amount of

water. I mean some of the estimates were made, you know the ten to fifteen gallons per hour, is just way off from what the reality is.

The acknowledged they made some guestimates, we are more than happy to furnish the data that is based on lab tests and field tests. The tests that were done in extremely hot climates such as Las Vegas showed that there is water consumption certainly, if you want to make a consumer aware of that, that is fine.

What they came up with in Las Vegas was something like $25.00 saved on electricity for every one dollar spent on water. So, it was a very favorable situation for the consumer. The water impact over all was very very small. You are talking 1,000 gallons a year is pretty small.

MR. VERMA: These numbers for water uses due to (indiscernible), I did calculate that assuming all the energy the load on the house and all the (indiscernible) energy. If it is all used to convert water into steam, (indiscernible), even then it can't be ten to fifteen gallons. There number was reasonable like four to five.

MR. PAPE: Again, even if the 7,500 per year is correct, that even causes us concern

because a lot of our agencies are out there running programs to try and save five gallons a day, ten gallons a day. Something that is going to increase water use 30 gallons a day is cause for concern.

I'm not saying there is anything against it, but I also have trouble comparing $25.00 worth of energy for a $1.00 worth of water. As Karl said, water is not priced at its value. It is priced at the cost to transport it. It is not really fair to compare dollars when you are looking at -- certainly the homeowner is going to look at that, but from the water agency perspective, water is not being priced according to its value.

MR. PENNINGTON: Do you have any reaction to the mitigation measures that were identified?

MR. BACCHUS: The mitigation measures that I am recalling that we discussed was suggesting a guideline whereby new construction that, if possible, the consenate water being taken to the unit netting that into their requirements, and we would be in favor of that.

As far as use of gray water and things

of that nature, I think that depends on the individual homes. I don't know how many homes are able to use gray water. It seems like that may be a impractical requirement that would pretty much bar what I think is an effective technology.

As far as requirements --

MR. PENNINGTON: I'm not sure I even understand this notion of using gray water --

MR. PAPE: I was concerned they were saying using the water on the property taking the flush water --

MR. PENNINGTON: That is what I thought he meant --

MR. PAPE: -- and we kind of call that gray water. I have similar concerns, there is not a lot of property being built today, condo's that can really use, have enough vegetation to really use that water. So, I have a concern about including that in the equation saying it is not really lost, we are using it on the property.

MR. NITTLER: I think they are definitely talking about different things. You are talking about using it as the water in the system, and you are talking about the water that is already rejected from the system.

MR. PAPE: Okay.

MR. PENNINGTON: Other things that I heard him say was an expectation that energy efficient clothes washers be installed or a low water use toilet. I heard those --

MR. PAPE: Right, low water use washers, low water use toilets. There is a myriad of things, maybe they have landscape drip irrigation, something to offset increased water use --

MR. KURKA: Or weather based irrigation --

MR. PAPE: Weather based irrigation controller. The water agencies I believe we are not here to block this because I think it is a very important energy conservation tool. We just want to work together to find a way that we don't put the burden onto the water agencies in order to achieve energy conservation.

MR. PENNINGTON: Let me ask you more about what you are talking about here. Weather based irrigation controllers, what is that exactly?

MR. PAPE: Instead of being a clock timer to water the lawn, it is taking evapotransporation state data off of the state's

census done either through direct realized signals or historical data embedded in a chip in the system and watering, irrigating the landscape according to real plant needs rather than --

MR. PENNINGTON: Clock timing.

MR. PAPE: Yeah, every other day at 10:00 a.m.

MR. PENNINGTON: Are those controllers available?

MR. PAPE: Absolutely, they have been available for ten years.

MR. PENNINGTON: Do you have any idea of how much they cost for a single family house?

MR. PAPE: Anywhere from $300 to --

MR. KURKA: I don't really know. I would say to be conservative, to quote a large number.

MR. PENNINGTON: $300 would be tops.

MR. PAPE: It could be $150 to $300, that is why they are not used a lot because the consumer goes to the hardware store and sees a lawn genie for $20 --

MR. PENNINGTON: What is a decent regular clock timer cost?

MR. PAPE: I don't think there are

decent regular clock timers, but $30 or $40.

MR. KURKA: I am trying to think of probably all of the devices, that would be the most cost effective for saving a lot of water because about half of residential water usage is for irrigation. It is very inefficient.

MR. PENNINGTON: Are you implying that a clock --

MR. KURKA: No, no, don't use the clock one, use a weather based irrigation control one.

MR. PAPE: Again, this is only really applicable to homes that have substantial landscape. A lot of condominiums, townhouses, this isn't going to mean a lot if they don't have landscape attached.

MR. PENNINGTON: You mention another measure that I think I missed.

MR. PAPE: HET which is High Efficiency Toilets instead of the 1.6 gallon toilets, they will use 1.4, 1.2 dual flush toilets which will use an average of even less 1 gallon per flush. High efficiency clothes washers, keeping the multi showers out of the bathroom which is a big issue right now with the higher end homes, single family homes. They are putting in basically subverting

the federal law and putting in the other shower head, even though it is 2.5 gallons per minutes, but they have installed five of them instead of one in the same shower.

It's funny, but it is true. I don't want to limit it to this. I would like to open up discussion of different things that could help net out this increased water use. We are not trying to limit and say I've got all the good ideas. A lot of our members would like to participate in this.

MR. KURKA: At the same time, we don't want to drag the process out. Personally, I think improved energy efficiency is extremely important, and I don't want to bog this down. This endless process. We could pretty much do it ourselves.

MR. NITTLER: Why don't you give them your TDV methodology, and they could set their water bills to properly accommodate the problem. Then the marketplace would take care of it.

MR. PAPE: The other thing is if we could do a study on and work with you on a study. We do a lot of research work, and if you have current installations that we could get historical pre-treatment and post-treatment water bills and

kind of look to see.

I realize that a broken toilet could throw off the numbers, but we have done a lot of water subject research and kind of have methodologies to normalize the data for things like that. I don't know if there is information available out there, but we would like to take a look at it.

MR. KURKA: Or just studying the water usage of the unit.

MR. BACCHUS: For the most part, there is not. Let me point out that you have made some estimates of water uses that are in order of magnitude higher than what the reality is, then, therefore, you are assuming that there would be enough water information to say a house before and after would show a significant change in water.

The actual fact is that there have been a number of studies done on water consumption and some of the ones I've mentioned. The difficulty they had was having a meter that would measure a flow rate of two or three gallons an hour and yet would allow enough flow to be able to refill quick enough after a flush to not shut off the air conditioner and cause an operational problem.

It is very small, again, a quarter inch water line is what we are talking about. We are not talking about a three quarter water inch which would be nine times bigger. I don't think that Freus, as an organization, would have a problem saying, we would even be willing to put a label on there that says this unit consumes water and you should look at other water conserving measures.

But to make the responsibility of Freus or any other evap condenser to say a house must do these other water measures is going to put such an economic burden, $300, in an industry where an entire air coolant condensing unit currently is only about $320 means that our entire competitors prices is less than what you are asking us to include. It would make us economically thrown out of the market.

MR. KURKA: We don't usually do things that way. We offer like a $50 rebate as an incentive for people to choose more energy efficient project.

MR. PAPE: We are not out to set requirements. Most of the agencies do rebates. Maybe it is just a matter of the view, you know, where these get installed, we promote the rebates.

Hey, you know, you can also get $200 off on a high efficiency washer. It is not unusual for water agencies to offer that.

I do have a concern about the two or three gallons per minutes. Is that a continual --

MR. BACCHUS: Per hour.

MR. PAPE: Per hour, I mean two or three gallons per hour, that is a continual flow at the rate of two or three gallons per hour.

MR. BACCHUS: It depends on what your operation is. Air conditioning typically cycles anywhere from three to six times per hour. Then peak conditions it should actually run the full hour.

MR. PAPE: I guess i have a concern that this could either be more problematic because this wouldn't even -- if it is a constant flow of two to three gallons per hour, that wouldn't even turn the water meter, which means this water is going to be consumed and not even be registered on the meter for the water agencies to track unless it is a spike. I mean when it turns on, would its flow -- I mean, you are right, we wouldn't be able to monitor bills and see an increased water use, even if it was there because -- most meters --

MR. PENNINGTON: How does that compare with water use for other end uses like for toilets? Do you see that on a water meter?

MR. PAPE: Absolutely. Generally the sensitivity of meters is about a pint of water per minute roughly. You have to get that much flow for it to show up. We get data loggers on meters around the country have done studies and actually can see and learn what appliances how much money or how much water because you can do the trace of the graph of how the water gets used. There is a certain profile that a toilet when it uses water how it shows up on the graph. We can look at homes and say that they flushed their toilet sixteen times that day or four times and used the washer twice and took three showers and ran the dishwasher twice.

MR. PENNINGTON: Tell me again what's the sensitivity, I'm --

MR. PAPE: Generally a meter, a water meter, and this is roughly that's got a little bit of age on it is about a pint of water per minute.

MR. PENNINGTON: If they are doing two or three gallons per minute --

MR. PAPE: Per hour.

MR. PENNINGTON: Per hour, okay, got ya.
MR. PAPE: Right.
MR. BACCHUS: It is the same thing as when your ice machine fails. It is the exact same quarter inch line when your ice machine turns on to fill the tray and then dump the tray when the ice is made and then refill again --
MR. PAPE: Then that probably should show up.
MR. BACCHUS: It is the same thing as you've got as far as control wise as in evaporative coolers of which there are several million across California. So, we are not doing something different than what is already there.
MR. PAPE: So, then it should show up if it is cycling like an ice machine --
MR. KURKA: Is it cycling, or is it drip slow (inaudible)?
MR. BACCHUS: It is has a float valve. The float valve has to drop down enough to open up, and then as the water level raises, it will squeeze off and turn back off, so it is not -- and it varies with the valve. I mean your flow is the same line as you have connected on an ice machine.
MR. NITTLER: After the flush, it would

need to replenish the entire reservoir --

MR. PAPE: The flush wouldn't register, it would just be the constant refill that is questionable. The flush shouldn't register on there.

MR. KURKA: Also we are not concerned that it comes in in a quarter inch line, that is where a huge amount of waste comes in. That is what feeds a toilet, that is what feeds all your faucets. That is not so much an issue.

MR. BACCHUS: It is my understanding of what you've said, you are not asking for a requirement to be placed to link this with any other devices, and you would perhaps be happy if we put a label on there that suggested that this unit does consume water and consumers should look at other water consuming devices and possible rebates in their area for other water saving devices?

MR. KURKA: I don't think we can say right now until we look at the water --

MR. PAPE: Right.

MR. KURKA: -- data.

MR. PAPE: We can't tell you definitely what we are recommending. I guess our first

concern is that water agencies know how much water these are using, what are the possible problems so that when they see a thousand home develop go in to their district and they are expecting on the average of summer peak of 300 gallons per day per unit, and if it is 350, they need to know that or 400 or whatever it is. That is I think our first concern.

Then what we can do to get a better assessment of the real water use in real life situations, what would the peak be in the summer. I mean our rule is to give this information to our members and have them kind of decide what they want to do with it, you know, where they want to go with it.

MR. PENNINGTON: What kind of turn around would we expect once you had information and then we would hear back from your members?

MR. KURKA: I would have to say that Tom would have to be doing this because I am totally swamped right now, and he is the technical --

MR. PENNINGTON: I guess the question really focuses on the members time rather than Tom's time.

MR. PAPE: I need to give a report to

the members. We came in today with these guesstimate because that is the best we could do because we kind of learned about this a couple of days ago.

MR. KURKA: We didn't know this until Friday.

MR. PAPE: I am not standing behind these estimates. We could be off by a factor of ten. I don't know. I'd like to give a more accurate report to the residential sub-committee who would be dealing with this. We are looking at having a meeting in early December. I certainly would like to give a report to them at that meeting the best I could and have them look at what action they want to go forward with it.

MR. PENNINGTON: Absent your comment, we probably would be at a Commission approval process at about a month from now. So, if there is any way we could get your comment faster than two months from now, that would be very desirable.

MR. PAPE: I can send out -- I could avoid waiting for the meeting. If we could get some better estimates and real understanding of what the real impact is, I can send out a synopsis to the members, e-mail it to them, ask for comment

to review to come back, and kind of do sort of an emergency appeal to them to make comments before the December meeting.

Most of members looking at a statewide level, our members are really concerned about what is going to happen at this home in Bakersfield, what is going to happen at this home in downtown LA. You know, that is where they are going to see the impact.

You know, if it is zero net water use because of water saved at the power plant, state level that's great, the water agencies would like to know how that impacts them directly. Even water going through a lot of them do not provide waste water don't have access to the waste water even if it is reclaimed, so that doesn't help them either.

That is the level they want to look at. That is numbers we are looking to provide to our membership. Does that help?

MR. KURKA: I don't think we can do it in just a month, you've --

MR. PAPE: I've got a lot of other things. It really depends on how much information I can get. Number one, how fast I can get

something that. I doubt I can do it in a month. I can try, but especially with the holidays coming up, it is going to be very difficult. Of course, I realize the Commission doesn't have to wait for us.

MR. PENNINGTON: Do you know if your members tend to have requirements related to evaporative coolers?

MR. PAPE: They tend to not accept as part of their if they are a municipality or county where they can have ordinances, non-water waste ordinances, generalized ordinance. That is the other issue that I've thought of too. If these things were to replace an evaporative cooler, the evaporative coolers are already using water, so the net water wouldn't be as much. I thought about that, and I don't know what market this unit is going after, if it would be an exchange of an evaporative cooler or if it is really going after a regular air conditioner.

No, they generally do not have regulations regarding evaporative coolers specific to the evaporative cooler, although they have looked at it, and it has been talked about. The difficulty is if you are going to put in a

regulation or ordinance, how do you control that? How do you verify that people are in compliance? It is difficult.

MR. PENNINGTON: There does seem to be somewhat of an equity concern about if there is a lack of a requirement from a very high water using device and here is a device that uses less water than that, arguably, there seems to be an equity issue with that.

MR. PAPE: Absolutely, and we should not unfairly pick on the new device when there is the old device out there that is using or wasting more water. I agree completely.

MR. KURKA: We can't force the members to (inaudible).

MR. PENNINGTON: I am not asking you to retrofit and set a requirement for an evaporative cooler, I am just asking you to take that into account in your comments.

MR. PAPE: I will include that in any report that we give our membership to keep in mind, evaporative coolers were out there for some districts that nothing is being -- no real hard work is being done on them. I agree completely.

MR. KURKA: The other point to make, I

mean, part of the impetus for us coming here is it is much cheaper to prevent a high water using appliance -- I am not saying it is, but to be installed and then for us to go back and retrofit. Retrofitting is extremely expensive compared to making sure they are efficient things. We know that with energy it goes in at the start. So, we are trying to take a close look at new things that are being introduced just because it is --

MR. PENNINGTON: It was mentioned early on, Tom mentioned it, that one of the ways to significantly reduce air conditioning energy use is to bring evaporation into the process and take advantage of evaporation. The energy savings potential is potentially huge.

In terms of trying to balance the water and energy issues, it is really important to recognize that we are probably not talking about a little small increment of energy benefit here. We are probably talking about a major energy benefit here. So, we do need to I think judge both resources together, but this is not small potatoes. It is only small potatoes if they don't gain any market share. Ultimately, it could be very important to California's energy use pattern

to have this kind of technology available.

MR. PAPE: Absolutely true.

MR. PENNINGTON: Finding a solution to your concerns could be actually very important to this state.

MR. PAPE: Maybe our concerns are unwarranted. We admit that. Maybe this isn't as big a deal as we think it could be. So, you are right.

MR. MAEDA: I have a question. Bruce Maeda, California Energy Commission. Initially, you are talking about some annual increment so say a new house, but the house itself is the bigger increment than whatever it is you might be adding on. Now it has been argued that agriculture use is approximately equivalent to residential use in terms of water, but you may be within the range of you may actually be reducing the usage if you convert evenly, you have a slightly higher use. Allowing that house to be built to begin with cost you a lot more water than adding on a Freus unit to that house that is being built.

The development issue is probably more important than the fact that it has a particular appliance that uses a little bit more water.

MR. KURKA: We have no control over the development, growth --

MR. MAEDA: No, water agencies have restricted development in certain areas in certain ways, but at least a lot of city accounts are taking that into consideration, but the opposite is there is a lot of pressure not to do that.

MR. PAPE: That's true, but we are starting to get calls on development. There are things going on, there is some agencies and counties and cities have done zero demand increase which is if you are going to develop a new subdivision or shopping mall or something, you have to look at the water use, and you have to find ways to help the county save water in other places. Some places you have to go -- if you change out all of the toilets at this school to use less water, we will let you build the shopping mall because the water saved would be equal to the water used.

It is starting to become somewhat contentious because I am starting to get calls wondering what is the water use of a new home. Well, this is where it kind of comes in. If the water agency is planning on 300 gallons per day

per home on average, and it is actually 330, well, that is a ten percent increase, and they are not necessarily prepared for that impact.

Maybe it is a 310 gallon increase, and it is only three percent, and they could probably deal with that. I want something to be able to tell our water agencies or members what impact this could have.

MR. PENNINGTON: One of the difficulties from the manufacturers vantage point with mitigation ideas is that at the first order here anyway, they have control over there equipment and what their equipment does, and they don't have control over what other uses are in the house and that falls to the builder. So, it is way up stream to another to try to control the things you've mentioned.

If there was something that could mitigate water use that was associated with this particular device, that would be something that would be more in the manufacturer's control, so I don't know if there is any value in thinking about that.

MR. PAPE: We will give it some thought, and I am sure the manufacturers probably have a

better idea of what could possibly done than we can, but anything is possible. We are open to anything.

MR. PENNINGTON: I don't know if you have a reaction at all to that.

MR. BACCHUS: I don't understand what is being suggested there.

MR. PENNINGTON: He was suggesting low flow toilets or climate controlled sprinkler systems or clothes washers, high efficiency clothes washers, which are all something the builder has control over maybe. So, you know, you could imagine a situation where the builder would be obligated to do something.

That is beyond your control. So, is there something about your device that could be done that would help mitigate the water use that they are concerned with.

MR. BACCHUS: I think that the things that we've already -- water has been a major focus we've placed a lot of emphasis on to try and make sure that we look at the condition, usage, and do everything possible as well as providing technical bulletins on what the water usage and what it will be.

I think putting requirements on that amount to having to link it to toilets and other things in the house is just a show stopper to where we can't get it done. If we have to have an air conditioning contractor having to deal with plumbing which means he has to bring another trade in, it just makes it to where it is too difficult to do and it makes it no longer enough an advantage to where it will get done. I think that is an unreasonable requirement as far as putting in information to say here are other things that can be done. We can put a bulletin on the unit, will you be willing to do that, but whether or not someone is going to read it and react to it would be the consumer's responsibility.

We can provide the information, we can't force them to act on it. I think if we have a requirement that forces us to act on it, it is just keeping us from being able to implement. I think there are already water regulations in place such as the regulations I quoted from both Fresno and Bakersfield where they have said here are the standards, here is what must be met for this locale.

In most cases, we are dramatically

better than those standards. We have been very successful in achieving much lower water consumption than what is allowed for comparable condensing technology, the same process in commercial applications.

It doesn't make sense to add requirements that will in effect knock us out of the market.

MR. PENNINGTON: What kinds of things have you done to lower water usage relative to what you otherwise would have done?

MR. BACCHUS: We have, as an example, we have a 5 1/2 inch thick drift eliminator that catches water that otherwise could spray out of the top of the unit and be much greater amount of aerosol and water loss, and that water is caught and drained back into the unit so that if you feel the air coming out of the top of a Freus unit, there is virtually no moisture you can feel. You don't get any water droplets or things of that nature.

If we did not have a drift eliminator, then the water consumption could be ten times greater. There is other issues of spraying water out, but we've gone to great extent to make sure

the water is captured.

We've got sup design such that water doesn't splash out of the unit. We are optimizing the air volumes to reduce water consumption so that we are not blowing more air through than is needed to do the evaporation and the cooling of the coils and thereby have greatly optimized the level of water consumption.

It is pretty substantial to be 84 percent below the amount allowed in Fresno for evap condensers. That shows that we have done dramatically better than the standards that were established to allow the commercial equipment that is already being used.

MR. PENNINGTON: One of the things that we found interesting about this unit was that it has done a lot of technology kind of changes that are superior to what run of the mill systems would be. That is related to corrosion, related to their flushing system that you have engineering techniques have been taken here that are really very good. That was one of the things that made this very interesting to us because those relate to the reliability of the unit and one of the things we are concerned about is that these units

remain reliable and we continue to get the energy savings over time.

Those kinds of features were very interesting to us. One of the things that we did is in establishing eligibility criteria, we said, okay, we are going to approve this device on the condition that you have these kinds of engineering techniques to avoid problems that might impact reliability down the line.

If another applicant comes along or another competitor comes along, they are obligated to have a similar level of engineering in the issues that we were concerned about related to energy as this device. So, it really raises the bar for whatever competition would come along related to those issues.

I think they've done similar things related to water use, and we don't specify anything related to that in our eligibility criteria, but you could have perhaps competitors to this system come in and have maybe more water use than is what is being estimated here.

One thought is that perhaps we might get specific about some of these water use parameters in our eligibility criteria. That would probably

not impact them, but it might impact competitors that would come in with an increased water using system.

MR. PAPE: I think we would applaud that. It is great that they did it and did everything to save water, but let's make sure the new products who come behind them also have that same.

MR. PENNINGTON: I don't know how we would specify that. You know, one thing you say you beat Fresno's requirements by a wide margin. Perhaps there could be an expectation that normal local ordinance requirements are beat by a significant margin, and maybe it could be expressed in those terms.

MR. PAPE: I would guess that Fresno's requirements might be non-typical of -- I think we would rather have it at a state level if we could rather than have to get every individual. I think they'd rather meet a state requirement than to have to worry about meeting every town and county.

MR. PENNINGTON: Absolutely, absolutely.

MR. PAPE: I do have a question. The typical summer peak, you do the three ton unit is your typical size unit, three ton?

MR. BACCHUS: Three ton is one of the largest uses, yes.

MR. PAPE: You are looking at they say two to three gallons per hour of water use, that is with the flushing cycles, that includes that?

MR. BACCHUS: A three tone would have an evaporation rate of 4.43 gallons per hour. Typical condense state recovery of 1.27. So, you would net that out.

MR. PAPE: If you could.

MR. BACCHUS: If you could.

MR. PAPE: If you could, okay. We are looking at let's say four gallons per hour, that includes the flushing cycle, that is not just evaporation.

MR. BACCHUS: No, that's just evaporation.

MR. PAPE: Let's see flushing, the blow down or flushing, whatever, how much does that use?

MR. VERMA: Eight gallons per cycle.

MR. BACCHUS: Yeah, that is so one gallon per hour.

MR. PAPE: Per flush and where would typically flush once per eight hours, is that what

you are saying?

MR. BACCHUS: Yeah.

MR. NITTLER: Eight full load hours or --

MR. VERMA: Full load hours, yes.

MR. PAPE: Again, I'm not --

MR. BACCHUS: It is not clock time because you have to look at it and say if you have a peak condition in California and that may be four full load hours because of the cycling. It varies depending on which climate zone you are in.

MR. PAPE: A peak load condition, you are at what time is not 100 percent, it is --

MR. BACCHUS: It is not 100 percent of 24 hours, it may be 100 percent of the top hour.

MR. PAPE: Okay.

MR. MAEDA: Usually temperature is very spikey, especially for high end temperatures. Low end temperatures are not, they can be very flat and long enduring, but high temperatures are relatively spikey, so they don't endure for a long period and pull load. It is very unusual, almost --

MR. PAPE: Let's use Sacramento climate just for an example, what would be the run time

over 24 day period during a peak summer --

MR. BACCHUS: If you look at Sacramento and you said that there is approximately 300 full load hours for the entire year based on that straight data, is that about right?

MR. MAEDA: Again, 80 degrees fahrenheit is about 800 or 900, but that is not full load, so --

MR. BACCHUS: Full load hours based on my recollection, and, of course, I'm dealing all over the country, but I think that is in the right order of magnitude. These 300 hours a year for Sacramento. Now if you take out of that and said, okay, 300 hours for the year times 5.43 including the flush, would be 1,600 gallons for the year. Now, how much of that is on the very peak, one day? That would take some analysis. I haven't done that analysis before to try and figure out, but, again, that is the whole year.

MR. PAPE: Right, so could we guess it 75 percent, 50 percent? I am just trying to get a rough number here.

MR. BACCHUS: 50 percent of that amount in one day?

MR. PAPE: During the day, on the

hottest day of the year during a 24 hour a day, it is on 50 percent of the time on average. Its run time is 50 percent or is it 70? I am just trying to get a really rough number here.

MR. KURKA: I'm going to have to go, Tom can certainly handle everything, but I appreciate the opportunity.

MR. PENNINGTON: We view your comments as important comments, and we want to address your comments. We would like to engage you in an intensive process to get that done quickly.

MR. KURKA: I'll let Tom --

MR. PAPE: I've probably taken up more time here on this. I was just trying to get a rough better understanding, a better number than I have now and looking to --

MR. MAEDA: I think we can get typically full load hours for a day or two or a period of time.

MR. BACCHUS: We could do an analysis and get that to you very quickly. I can't --

MR. PAPE: Okay, that's --

MR. BACCHUS: Do you have a card by chance also, I've got --

MR. MAEDA: Although from your point of

view --

MR. PAPE: I guess I would like to be able to just speed this along, take to my membership say, for instance, worst case peak day in San Diego, would use this many gallons that day. Sacramento -- you know, just give a few examples around the state. If nothing else, it would calm them down from freaking out and thinking this is going to dry up their county.

You know a real life rough idea, you know, 7,500 gallons per year doesn't even really tell them anything. I mean, what part of the year is that going to happen is not real meaningful to them.

I think their biggest concern is what is going to happen on a peak day.

MR. BACCHUS: Peak day or the peak month.

MR. PAPE: Or the peak month. You know, that depends on what their storage capacity of it is if they do peak weeks or peak days.

MR. NITTLER: Does the Commission know or somebody know if the peak water day is the same as the peak energy day? Is there a direct relationship there since it is largely temperature

driven on energy. Is it temperature driven on water peak days?

MR. PAPE: It shouldn't be, but it is because people look at -- actually the peak day watering requirements for plants landscaping is really in July, but it usually hits the peak water use day hits in August or such where it gets a little hotter because people relate to, oh, it is hot today, I better go and water my lawn instead of really understanding how the lawn uses water. So, generally, peak water use hits the hottest days of the year.

MR. PENNINGTON: As far as I know, we don't have that information, but that sounds plausible to me.

MR. MAEDA: For your worst case situation, you are probably looking at something like our climate is on 15 load desert, like Palm Springs or Palm Desert and the like.

MR. PAPE: We actually don't have any members from that area, but, no --

MR. MAEDA: They use a lot of electric.

MR. PAPE: Thank you. We have members all across the state, and I don't want to give them that number for someone in Los Angeles or

Berkeley or Napa because that is going to put them into hysterics if it is not true for their situation.

I would just like five or six areas where --

MR. MAEDA: Geographic distribution of the water usage is important for you in particular. Another thing you might want to consider, and I don't know how much -- I imagine that the water usage goes up as the tonnage goes up except for the flush perhaps which might be (indiscernible).

Basically, by going into the standards and getting a credit within the standards, they are allowing the energy savings to be used, TDV energy savings to be used somewhere else so they actually get -- well, they might be raising the capacity of the unit because they get some savings, and perhaps you want to address that issue or perhaps reduce the credit they get in order to make sure some of the savings occurs and the tonnage doesn't go up too much relative to the trade offs that are allowed. That is a possibility. There is an issue there in terms of capacity of where they might save a lot of energy

and then they are allowed to increase the load somewhere, but that is a big incentive for them because that is what sells their product too. There is a balance between those two items.

MR. BACCHUS: I guess what I would rather provide is information sent for the sixteen climate zones, here is the water consumption based on the same data that is used for the energy, here is the water consumption for the peak month and for the entire year.

My problem with giving information for just the peak day is that I think members will tend to take that number and multiply it times the whole year and say this is how much water it is going to use, and that will give them a very distorted perspective. If we give them the peak month and the entire year, I think that will give them appropriate perspective if that is an acceptable way to do it.

MR. PAPE: I think that's acceptable. I think we can -- the peak month will be useable enough and, yes, I understand your concern. I've had some of our members take some watering number and take it 365 days a year. So, I will be sure to present it in such a way that they understand

it.

MR. PENNINGTON: Do we need anymore clarity here between what information is needed and wanted? We could talk off line here more about that to make sure it is clear.

MR. PAPE: I think we've got each other's numbers and go forward I'll look for some information.

MR. PENNINGTON: Include the Commission in your dialogue in some way. Okay. Are there other comments? I see everyone is about ready to dash for the door. Do either of you have comments?

(No response.)

MR. VERMA: Okay, thank you very much.

(Whereupon, at 12:00 p.m., the workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, CHRISTOPHER LOVERRO, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 5th day of November, 2005.